Waveguides in Pillar Photonic Crystals for Integrated Optical Buffers

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A new structure of pillar PC is suitable for optical buffers, which are needed for routing photonic packets in photonic network. The delay time for a 5×5-mm pillar-PC chip would be several tens of nanoseconds.

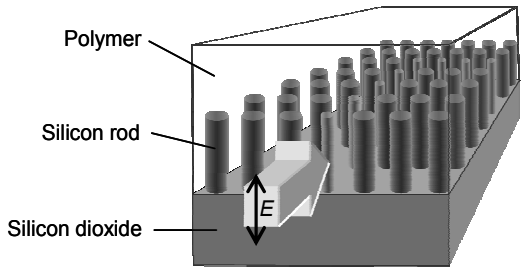

Fig. 1: Schematic of pillar PC.

Figure 1 shows the structure of new pillar PC with a bent line-defect. A calculated dispersion relation showed that a guided mode ranged from λ =1525 nm to λ =1603 nm ($\Delta\lambda$ = 78 nm) for a lattice constant a = 0.43 μm. A group velocity of guided light was measured with a fabricated sample and was found to range from 0.1c to 0.2c, where c is the speed of light in a vacuum. Also, our 3D-FDTD simulation revealed that a 90° bend of the waveguide efficiently transmits light over a wavelength range of 60 nm. Combining the small group velocity and the compact folding of waveguide using 90° bends would enable a 5×5-mm PC chip of pillar PC waveguide to produce a delay time of several tens of nanoseconds.

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